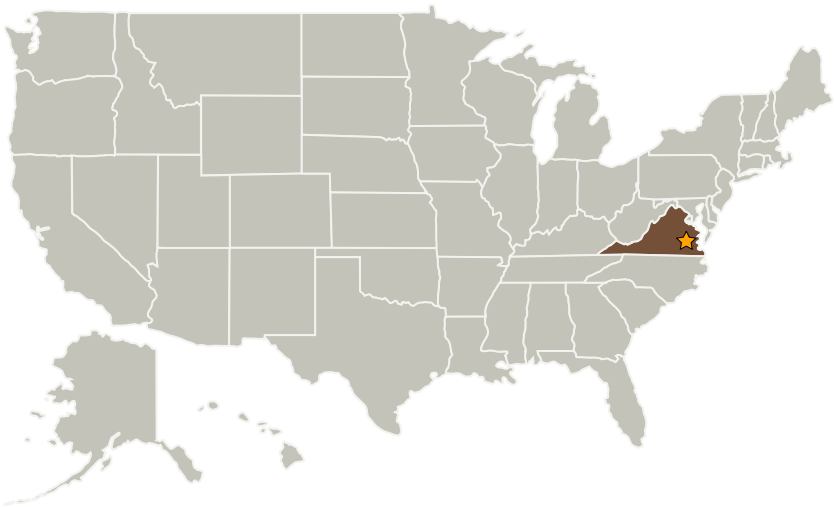
Embedded Structural Integrity Sensor, Phase I

Completed Technology Project (2007 - 2008)

Project Introduction

In this work Luna Innovations in partnership with Pennsylvania State University proposes to develop a new thermo-ultrasonic technology for the real-time in-situ monitoring of critical metallic, composite and bonded structural health parameters during space exploration missions. The potential applications of the proposed technique include characterization of component response to loading, monitoring load distribution, and identifying stresses exceeding design in a variety of structural materials and geometries. Another important usage area is assessment of the effects of structural defects on the system's performance, early detection of damage, and prediction of the remaining service life of critical components. The technology will utilize sparse networks of built-in or surface-mounted miniature lightweight ultrasonic sensors with low power consumption levels suitable for space deployment. A combination of specially designed sensor excitation mechanism and accurate velocimetry yields very high sensitivity to critical structural performance parameters. In Phase I we will demonstrate feasibility of the proposed approach on laboratory specimens subjected to load, and verify the results against mathematical models and FEM simulation. In Phase II we will develop a full-featured prototype unit and demonstrate all the benefits of the new technology on a representative flight component.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
Luna Innovations, Inc.	Supporting Organization	Industry	Roanoke, Virginia

Primary U.S. Work Locations
Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Mark Mckenna

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.2 Structures
    - TX12.2.3 Reliability and Sustainment